

If a telephone call originates in a foreign country, the network operator of the visited public land mobile network (VPLMN) currently usually earns 70% of the fees paid by the network subscriber whereas the operator of the home public land mobile network (HPLMN) only receives 30%.

### **Description of the Prior Art**

The customer of telecommunication networks, mobile radio networks, is already being offered a multiplicity of telecommunication services. To be able to offer new services rapidly and independently of manufacture and network operator, if possible, including the existing infrastructure, the concept of the Intelligent Network has been developed. A standardized concept which defines the IN architecture has been worked out in the ITU (see Standards Q.1200 ff).

In a further development, CAMEL (Customized Application for Mobile Network Enhanced Logic, see also GSM 02.78) was developed in which IN features were introduced into the GSM architecture. CAMEL simplifies roaming both internationally and between networks of different operators and creates a uniform protocol for accessing CAMEL servers in other GSM networks.

It is an object of the present invention, therefore, to specify a solution to the abovementioned problem in international or inter-provider roaming.

It is another object of the present invention to implement a call back service in a mobile radio network.

### **SUMMARY OF THE INVENTION**

Accordingly, the call back service for roaming mobile radio subscribers of the present invention allows PLMN operators to use the advantages of a call back service.

The call back service UCB (USSD (unstructured supplementary service data) Call Back Service) provides the desired functions:

- Analysis of an incoming USSD string,
- Analysis of A party and B party,
- Call set-up to the A party,
- Call set-up to the B party.

The IN service UCB is triggered via a USSD string from the visited network VPLMN. If the roaming subscriber is not an IN (intelligent network)

customer, the HLR (home location register) forwards the USSD string to a standard SCP which supports UCB. If he is an IN customer, the correct service control point SCP address is located in the CAMEL Subscriber Information CSI.

Using a call back service, the ratio of fees can be reversed in favor of the HPLMN operator of the home network. Since the call is set up by the HPLMN, the HPLMN operator now receives the greater proportion of the fees.

The interworking of the novel USSD Call back Service UCB with other IN services also will be described. The special feature is that UCB enables roaming subscribers to telephone via IN even if the visited network (VPLMN) does not support the CAMEL protocol.

The UCB service is, thus, available to roaming IN customers who can use their subscribed service even without CAMEL. That is, roaming subscribers use CAMEL in VPLMNs which support CAMEL, and in countries without CAMEL support, the USSD solution is used.

Furthermore, non-IN customers also can use UCB.

Another problem is interworking between a number of IN services in an SCP. This problem is solved by the IN service UCB cleverly setting the Called Party Address (CdPA) and Calling Party Address (CgPA).

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Preferred Embodiments and the Drawings.

### **DESCRIPTION OF THE DRAWINGS**

Figure 1 shows the activation of the UCB service in the SCP;

Figure 2 shows how the call back connection according to the present invention is set up; and

Figure 3 shows the interworking with a telecommunication network which does not support CAMEL.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Figure 1 shows how the call back service UCB is triggered by an incoming USSD (Unstructured Supplementary Service Data) string which is transmitted by the roaming mobile radio subscriber via the mobile switching center MSC in the visited network VPLMN, A.

A USSD string is normally intended for the home location register HLR in which the subscriber is administered. Here, however, the "follow-me" (SR7) function available in Siemens HLRs is triggered via the USSD string header. On the one hand, it expands the USSD string by the MSISDN (Mobile Subscriber ISDN Number) of the subscriber (A party) and then forwards it to a service control point SCP which supports the call back service UCB (B).

The SCP starts the IN service UCB. This service, in turn, returns to the A party a USSD string which acknowledges the receipt, C, D.

The IN service UCB first sets up a connection to the A party via "Initiate Call Attempt" ICA, see Figure 2. Calling party CgPA is now the Called Party CdPA (B party) actually dialed and CdPA is the original CgPA (MSISDN of the A party). At the same time, all Event Detection Points EDP are armed with RequestReportBCSMEEvent RRB, 21, and then the procedure continues with "Continue" CUE.

According to the GSM standard, a gateway mobile switching center GMSC interrogates the home location register HLR of the subscriber with SendRoutingInformation SRI, 22, 23. The connection to the roaming party is set up via an IAM, 24. The service UCB receives via EventReportBCSM ERB the information whether the A party has answered (answer), is busy, is not answering (no\_answer) or not available (not\_reachable), 25.

In the case of the "answer", UCB responds with FurnishChargingInformation FCI so that an IN charges (AMA) ticket is written in the GMSC, and the operation "connect" CON which establishes the connection with the B party originally requested, 26.

In all other events (busy, no\_answer, not\_reachable), the IN dialog is ended in an ordered manner with "ReleaseCall" RL. Apart from "answer", it is not absolutely necessary to set the flags of the EDPs. If, for example, the "not\_reachable" flag is not set, the SCP does not find out about this event. The GMSC releases the call by itself and the SCP responds in the same way if it does not receive any information within a certain time.

Charging is ensured by the scenario. Using "answer" by A, the GMSC generates a "roaming ticket" in which the answer time is entered. In the VMSC of

the A party, an "MTC (mobile terminated cell) Ticket" is written and the SSP writes an "IN AMA (automatic message accounting) Ticket" due to the FCI (furnish charging information) operation.

Using "GetUserRecord", UCB decides whether and which IN service has been subscribed to by the A party. If the A party has no IN subscription, UCB acts as described above.

If the A party has an IN subscription, UCB expands the CgPA in the InitiateCallAttempt ICA by an administerable number of administerable numbers XXX which also can contain hexadecimal digits (in Figure 3, the subscribed IN service prepaid service is shown by way of example), 1. The subsequent interrogation of the HLR, 2 and 3, possibly supplies a T-CSI.

Since the MTC IN dialog is not wanted - the roaming A party actually wants to transmit a mobile originated call (MOC) - it must either be suppressed via SDDPFC or in the EntryFSL (flexible service logic) or MTC (Mobile Terminated Call) service logic on the basis of the XXX code in the CgPA, 4 and 5. The second interrogation of the home location register HLR (second step in the two-stage interrogation!) supplies the MSRN (mobile station roaming number), 6 and 7, which provides for the connection to the A party, 8.

As soon as the A party answers, 9, the UCB is informed of this via ERB, 10. UCB then continues with the "Connect" operation CON which, as calling party CgPA, contains the MSISDN of the A party and, as called party CdPA, the number of the B party originally dialed, expanded by an administerable number of administerable numbers YYY (hexadecimal digits are possible), 11. Following YYY, a code point is to be set up at SSP which triggers the desired IN service at the "correct" SCP via an IDP (Initial Detection Point) (YYY must therefore be set up IN service-specifically).

Since the SCP has no information whatever about the A location of the A party, the service logic EntryFSL or the MOC IN service logic must determine the A location via the "AnyTimeInterrogation" ATI, 13. After that, the MOC service logic runs as if it had been started directly via a CAP (camel application part) :IDP. In the case shown, PPS (prepaid service) continues with "ApplyCharging" AC and "Connect" CON B party.